WE CLAIM:

1. In a hard drive assembly having an actuator, the actuator having an actuator voltage, a method of controlling the actuator comprising the steps of:

sampling the actuator voltage;

processing an actuator voltage sample for generating a digital voltage command;

applying the digital voltage command to control the actuator voltage.

2. A method according to claim 1 wherein the sampling step further comprises converting of an analog actuator voltage into a digital actuator voltage sample signal.

3. A method according to claim 1 wherein the step of applying the digital voltage command to control the actuator voltage further comprises converting the digital voltage command into an analog voltage level.

4. A method according to claim 1 wherein the step of applying the digital voltage command to control the actuator voltage further comprises using pulse width modulation.

5. A method according to claim 1 wherein the step of sampling the actuator voltage further comprises steps of:

putting the actuator in a high impedance state;

waiting for an actuator current to reach approximately zero; and

thereafter sampling the actuator voltage.

6. A method according to claim 1 wherein the step of processing the digital actuator voltage sample for generating a digital voltage command further comprises steps of calculating a velocity error and applying velocity error compensation to the digital voltage command.

7. In a hard drive assembly having an actuator, the actuator having an actuator voltage, a method of controlling the actuator according to claim 1 further comprising steps of, subsequent to the applying step, waiting for a selected time interval and reiterating the sampling, processing, and applying steps.

8. In a hard drive assembly having an actuator, the actuator having an actuator voltage, a method of controlling the actuator comprising the steps of:

sampling the actuator voltage;

sampling an actuator current;

calculating a BEMF using the sampled actuator voltage and sampled actuator current;

calculating a velocity error using the BEMF and a selected target voltage;

producing a digital voltage command for compensating the actuator voltage for the velocity error; and

applying a voltage at the actuator according to the digital voltage command.

9. A method according to claim 8 wherein the step of calculating a BEMF may be described by the formula,

BEMF = Vmtr – Imtr * Rmtr [Equation 2], wherein

Vmtr represents actuator motor voltage,

Imtr represents actuator current, and

Rmtr represents actuator motor resistance.

10. A method according to claim 8 wherein the step of calculating a velocity error, Ev, may be described by the formula,

Ev = Vtgt – BEMF [Equation 3], wherein

Vtgt represents target actuator voltage, and

BEMF represents the actual voltage across the actuator.

11. A method according to claim 8 wherein the digital voltage command, Vcmd, may be described by the formula,

Vcmd = ki * [x(n) + x(n-1)] + yi(n-1) + kp * x(n) + ffwd [Equation 4], wherein,

ki is a constant representing the magnitude of integral compensation to apply,

x(n) is a sample of the current value of the error term Ev,

yi represents the output of the integral portion of the compensation, and

ffwd represents a feed forward voltage that allows the loop to run with a zero error within the dynamic range of the integrator.

12. In a hard drive assembly having an actuator, the actuator having an actuator voltage, a method of controlling the actuator according to claim 8 further comprising the steps of, subsequent to the applying step, waiting for a selected time interval and reiterating the foregoing steps.

13. A velocity-controlled actuator apparatus in a hard drive assembly having an actuator motor, the velocity-controlled actuator apparatus comprising:

a sampler for sampling an actuator motor voltage and outputting a digital actuator motor voltage sample;

a timer for periodically activating the sampler; and

a digital processing engine for receiving a target actuator voltage command and the digital actuator motor voltage sample and for outputting a digital voltage command for controlling the actuator motor.

14. A velocity-controlled actuator apparatus according to claim 13 wherein the timer is further adapted for putting the actuator motor in a high impedance state.

15. A velocity-controlled actuator apparatus according to claim 13 further comprising a digital-to-analog converter for receiving the digital processing engine digital voltage command and outputting an analog voltage.

16. A velocity-controlled actuator apparatus according to claim 13 further comprising an analog-to-digital converter operatively coupled to the actuator motor and sampler for sampling an analog actuator voltage and providing a digital signal to the sampler.

17. A velocity-controlled actuator apparatus according to claim 13 wherein the digital processing engine further comprises a gain component for providing a pre-selected output gain.

18. A velocity-controlled actuator apparatus according to claim 13 wherein the digital processing engine further comprises an integrator for calculating the digital voltage command.

19. A velocity-controlled actuator apparatus according to claim 13 wherein the digital processing engine further comprises a digital processing engine shared by other functions in the hard drive assembly.

20. A velocity-controlled actuator apparatus according to claim 13 wherein the digital processing engine further comprises machine readable instructions according to Table 1.

21. A velocity-controlled actuator apparatus according to claim 13 wherein the digital processing engine further comprises machine readable instructions according to Table 2.

22. A velocity-controlled actuator apparatus according to claim 13 wherein the digital processing engine further comprises machine readable instructions according to Table 3.